

smoothly connected to the conical surface and curving away from the large end faces of the tapered rollers.

As further recited in each of independent claims 21 and 26, the large rib surface is shaped so that a boundary between the conical surface and the flank is located at an outer edge of a maximum contact oval formed by the contact between the large end faces of the tapered rollers and the conical surface of the large rib surface under a maximum permissible axial load of the tapered roller bearing. In addition, the large rib surface is formed so that a wedge-shaped base is defined between the flank and the large end faces of the tapered rollers for smoothly drawing lubricating oil between the conical surface and the large end faces of the tapered rollers. Consequently, as explained on page 30, paragraph [0105] of the specification, lubrication between the tapered rollers and the inner ring is improved so as to reduce torque loss and heat buildup due to sliding friction, thereby preventing seizure of the tapered roller bearing.

In the outstanding Office Action, the Examiner stated that he “finds all claimed subject matter to be present” in the Yasui reference, and referred to Figure 4. In setting forth the rejections, the Examiner essentially dismissed a limitation recited in each of independent claims 21 and 26 that describes the shape of the large rib surface. In particular, the Examiner asserted that the limitation describing that the boundary between the conical surface and the flank is located at an outer edge of a maximum contact oval formed by contact between the large end faces of the tapered rollers and the conical surface of the large rib surface under a maximum permissible axial load of the tapered roller bearing is either not entitled to patentable weight or is inherently disclosed in the Yasui reference. However, as will be explained in more detail below, the limitation discussed above *is* entitled to patentable weight when properly construed. Moreover, under this proper construction, the Yasui reference does not disclose (explicitly or inherently) or even suggest all of the elements recited in independent claims 21 and 26.

The Examiner asserted that the “boundary under load” limitation is a product-by-process limitation and, therefore, not entitled to patentable weight. In this regard, the Applicants presume that the Examiner is referring to the recited relationship between the outer edge of the maximum contact oval and the boundary between the conical surface and the flank discussed

above. If this presumption is correct, it is submitted that the Examiner's position is improper for several reasons, as explained below.

Firstly, a product-by-process limitation includes language describing a process of manufacturing at least a portion of a claimed product. None of the present claims, however, include any language describing a process of manufacturing a tapered roller bearing. Instead, the limitation referred to by the Examiner describes the *structure* of the large rib surface, albeit with respect to a particular condition of the tapered roller bearing. In this regard, the Examiner is requested to note that the inner ring and each of the tapered rollers are not completely rigid bodies, but are instead resiliently deformable when pressed against each other. The amount of deformation depends on the shape, size and material of the inner ring and each of the tapered rollers (and, of course, the load applied). Thus, even if the same axial load is applied to both a tapered roller bearing of the present invention and a conventional tapered roller bearing, the relationship between the maximum contact oval and the boundary between the conical surface and a flank will not necessarily be identical due to the difference in the shape, size, and material of the inner ring and tapered rollers of the present invention and prior art. In the present case, functional language is used to recite the *structural* difference achieved due to the differences in the shape, size, and material (i.e., *structural* characteristics) of the inner ring and the tapered rollers. Consequently, because the "boundary under load" limitation cited by the Examiner is clearly *structural* in nature as explained above, it is submitted that this feature is entitled to full patentable weight under a proper construction of the claims.

Under the above-discussed proper construction of the claims, it is submitted that the prior art does not disclose (even inherently) all of the features recited in independent claims 21 and 26. To help illustrate this point, a marked-up copy of Figure 9 has been submitted herewith as Appendix A to illustrate several of the features at issue. With reference to Appendix A, the outer edge of the maximum contact oval 45 is identified by the letter "X" which therefore also identifies the boundary between the conical surface 41a and the flank 41b (since the boundary is located *at* the outer edge, as recited in the claims). For comparison purposes, an illustration of a conventional roller bearing such as the Yasui reference has been prepared and submitted

herewith as Appendix B. In Appendix B, the letter “X” indicates the outer edge of the maximum contact oval (as in Appendix A). However, the letter “Y” of Appendix B indicates the boundary between the conical surface of the inner ring and the chamfer of the inner ring. As illustrated in Appendix B, the boundary “Y” is clearly not located at the outer edge of the maximum contact oval 45, as indicated by the letter “X.” Thus, it is clear that the boundary between the conical surface and the flank being located at an outer edge of a maximum contact oval as recited in independent claims 21 and 26 is clearly not explicitly or inherently disclosed in the Yasui reference. Moreover, the Yasui reference does not teach *any* particular relationship between an outer edge of a maximum contact oval and a boundary between a conical surface and a flank. Thus, it is submitted that the Yasui reference does not even suggest the large rib surface as recited in independent claims 21 and 26.

As explained above, the Yasui reference clearly does not disclose or even suggest the relationship between the outer edge of the maximum contact oval and the boundary between the conical surface and the flank as recited in independent claims 21 and 26. Furthermore, as clearly illustrated by the comparison between the marked-up version of Figure 9 in Appendix A and the figure illustrating a conventional roller bearing (such as the Yasui reference) in Appendix B, it is submitted that the Yasui reference also does not disclose or even suggest a flank smoothly connected to a conical surface and curving away from the large end faces of the tapered rollers, as also recited in each of independent claims 21 and 26. Due to the absence of an explicit or inherent teaching or even a suggestion of these features, it is submitted that one of ordinary skill in the art would not be motivated to modify the Yasui reference so as to obtain the invention recited in new independent claims 21 and 26. Accordingly, it is respectfully submitted that independent claims 21 and 26 are clearly patentable over the prior art of record.

In addition to the distinctions discussed above, it is submitted that dependent claims 23, 24, 28 and 29 recite additional features that further distinguish the present invention from the prior art. In particular, each of those claims recites that the large end face of each of the tapered rollers has a circular recess at a central portion thereof, and that the outer periphery of the recess extends to the boundary between the conical surface and the flank of the large rib surface. This

arrangement is also illustrated in Appendix A submitted herewith, and the advantages of this arrangement are discussed in paragraph [0041] of the original specification. In particular, the arrangement of the recess as recited in each of these dependent claims further improves the supply of lubricating oil between the tapered roller and the inner ring. Therefore, when combined with the features recited in the independent claims, lubrication between the tapered rollers and the inner ring can be significantly improved so as to further reduce torque loss and heat buildup.

In the outstanding Office Action, the Examiner acknowledged that the Yasui reference does not disclose a circular recess. Nonetheless, the Examiner asserted that it would be obvious to one having ordinary skill in the art “to employ this feature since it is known in the art.” Although the Examiner’s reasoning is not entirely clear, it appears that the Examiner is asserting that recesses are known in the art and, therefore, it would somehow be obvious to arrange a recess in a tapered roller as recited in each of the dependent claims. However, this is hindsight reasoning, and amounts to nothing more than what *could be* accomplished by one of ordinary skill in the art if so inclined *with the proper motivation*. It is well established, however, that what *could have been done* by one of ordinary skill in the art is not the proper test for obviousness. See *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984). Instead, there must be some motivation, suggestion, or teaching of the desirability of making the specific combination of features that was made by the Applicants. See *In re Fine*, 837 F.2d 1071, 5 USPQ 2d 1596 (Fed. Cir. 1988).

In the present case, the Examiner has pointed to no teaching in the art regarding the formation of a circular recess in combination with the other features as recited in the claims, but instead merely asserts that this is “common knowledge in the art.” Assuming for the moment that providing recesses is known in the art, however, this alone would not be sufficient to render to the claims obvious. Without a teaching or suggestion to provide the motivation to modify the Yasui reference as suggested by the Examiner, the rejection of claims 23, 24, 28, and 29 merely amounts to impermissible hindsight. Consequently, in addition to the reasons discussed above with respect to the independent claims, it is submitted that dependent claims 23, 24, 28, and 29 are clearly patentable over the prior art of record.

In view of the above amendments and remarks, it is submitted that the present application is now in condition for allowance. However, if the Examiner should have any comments or suggestions to help speed the prosecution of this application, the Examiner is requested to contact the Applicant's undersigned representative.

Respectfully submitted,

Takashi TSUJIMOTO et al.

By: 

W. Douglas Hamm
Registration No. 44,142
Attorney for Applicants

WDH/ck
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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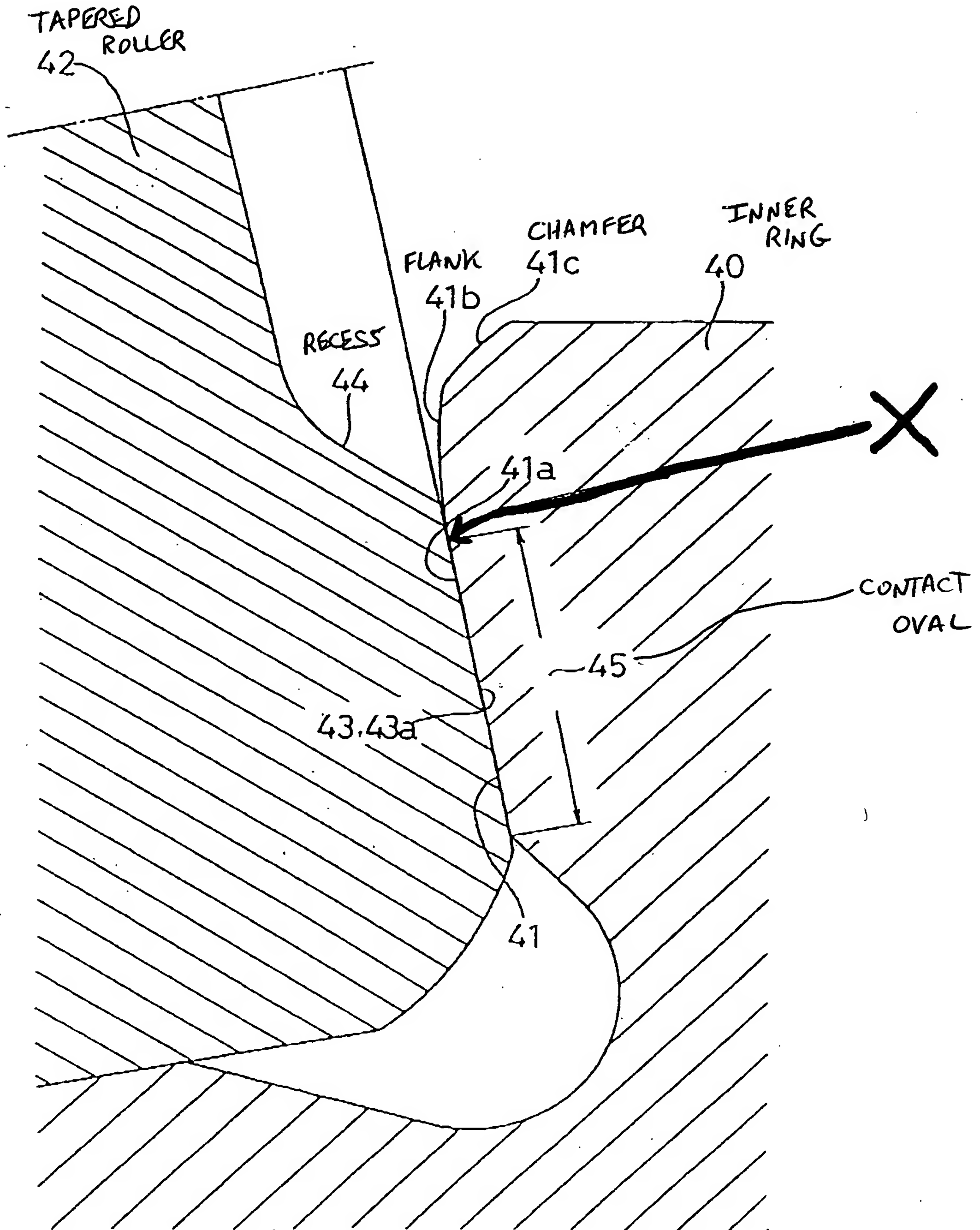
PRESENT INVENTION

APPENDIX A

IS APPLICATION

NO. 10/649,781

FIG. 9



APPENDIX B
US APPLICATION
NO. 10/649,764



CONVENTIONAL ROLLER BEARINGS (YASUI REFERENCE)

